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Proceedings of the regional Science Advisory Process on the Recovery Potential Assessment of Northern Madtom

March 19, 2012

WebEx / Teleconference

Nicholas Mandrak
Meeting Chairperson

Bruce McCulloch
Editor

Compte rendu du processus d'avis scientifique régional sur l'évaluation du potentiel de rétablissement du chat-fou du nord

Le 19 mars 2012

WebEx / Téléconférence

Nicholas Mandrak
Président de réunion

Bruce McCulloch
Éditeur

Fisheries and Oceans Canada / Pêches et Océans Canada
Great Lakes Laboratory for Fisheries and Aquatic Sciences /
Laboratoire des Grands Lacs pour les Pêches et les Sciences Aquatiques
867 Lakeshore Rd. / 867, Chemin Lakeshore
Burlington ON L7R 4A6 Canada

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Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. Le compte rendu peut aussi faire l'état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenues dans le présent rapport puissent être inexactes ou propres à induire en erreur, elles sont quand même reproduites aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considérée en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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200, rue Kent Street
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K1A 0E6

http://www.dfo-mpo.gc.ca/csas-sccs/

CSAS-SCCS@DFO-MPO.GC.CA

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TABLE OF CONTENTS

SUMMARY

A regional science peer-review meeting was held via teleconference/WebEx on 19 March 2012. The purpose of the meeting was to assess the recovery potential of Northern Madtom (*Noturus stigmosus*) based on the 27 steps outlined in the Fisheries and Oceans Canada (DFO) Recovery Potential Assessment (RPA) framework. Northern Madtom was added to Schedule I of the Species at Risk Act (SARA) when it was proclaimed in June 2003. The resulting RPA Science Advisory Report provides the information and scientific advice required for the Department to meet various requirements of SARA for this species including permitting and development of recovery strategies. Meeting participants included DFO (Central and Arctic Region), Ontario Ministry of Natural Resources, a specialist from University of Windsor, and the senior author of the 2012 update Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status report for Northern Madtom.

This proceedings report summarizes the relevant discussions from the peer-review meeting and presents revisions to be made to the associated research documents. The Science Advisory Report and the supporting Research Documents, resulting from this advisory meeting, are published on the DFO Canadian Science Advisory Secretariat Website at http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

SOMMAIRE

Une réunion régionale d'examen scientifique par les pairs par téléconférence et WebEx s'est tenue le 19 mars 2012. L'objectif de cette réunion était d'évaluer le potentiel de rétablissement du chat-fou du Nord (*Noturus stigmosus*) d'après les 27 étapes présentées dans le cadre d'évaluation du potentiel de rétablissement (EPR) de Pêches et Océans Canada (MPO). Le chat-fou du Nord a été ajouté à l'annexe I de la *Loi sur les espèces en péril* (LEP) lorsque celle-ci a été proclamée en juin 2003. L'avis scientifique découlant de l'EPR fournit les renseignements et l'avis scientifique dont le Ministère a besoin pour respecter les diverses exigences de la LEP à l'égard de cette espèce, notamment l'attribution de permis et l'élaboration de programmes de rétablissement. Parmi les participants à la réunion, on comptait des représentants du MPO (région du Centre et de l'Arctique), du ministère des Richesses naturelles de l'Ontario, un spécialiste de l'Université de Windsor et l'auteur principal de la mise à jour de 2012 du rapport de situation sur le chat-fou du Nord du Comité sur la situation des espèces en péril au Canada (COSEPAC).

Le présent compte rendu résume les discussions pertinentes de la réunion d'examen par les pairs et présente les modifications qui seront apportées aux documents de recherche connexes. L'avis scientifique et les documents de recherche à l'appui découlant de cette réunion de consultation sont publiés sur le site Web du SCCS à l'adresse suivante : http://www.dfo-mpo.gc.ca/csas-sccs/index-fra.htm.

INTRODUCTION

A meeting of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in April 1993 resulted in placement of Northern Madtom in the Data Deficient category. The species was re-examined in April 1998 and designated as Special Concern. In November 2002, Northern Madtom was uplisted to Endangered based on the existing 1998 status report with an addendum. The reason given for this designation was that, "This species has a very restricted Canadian range (two extant locations), which is impacted by deterioration in water quality and potential negative interactions with an exotic species. Subsequent to the COSEWIC designation, Northern Madtom was listed on Schedule 1 of the *Species at Risk Act* (SARA) when the Act was proclaimed in June 2003. COSEWIC will reassess the status of Northern Madtom in spring 2012. A Recovery Potential Assessment (RPA) process has been developed by Fisheries and Oceans Canada (DFO) to provide information and scientific advice needed to fulfill SARA requirements, including the development of recovery strategies and authorizations to carry out activities that would otherwise violate SARA (DFO 2007a and b).

The purpose of the meeting, as described in the Terms of Reference (Appendix 1), was to assess the recovery potential of Northern Madtom. The RPA is a science-based peer review process that assesses the current status of the species by addressing 27 steps in the RPA framework outlined in the Summary section of the Revised Protocol for Conducting Recovery Potential Assessments (DFO 2007a and b). The current state of knowledge about Northern Madtom habitat requirements, the scope for human-induced mortality, and scenarios for mitigation and alternatives to activities that negatively impact the species and its habitat, is included in the Science Advisory Report. A peer-review meeting was held via teleconference/WebEx on 19 March 2012 to discuss the Northern Madtom RPA.

Meeting participants included DFO (Central and Arctic Region), Ontario Ministry of Natural Resources, a specialist from University of Windsor and the senior author of the 2012 update COSEWIC u status report for Northern Madtom (Appendix 2). The meeting followed the agenda outlined in Appendix 3.

DETAILED DISCUSSION

The meeting chair provided the participants with an introduction to the RPA process and explained the purpose of the meeting. This included information on where the RPA process fits with respect to the COSEWIC assessment and SARA listing process for Northern Madtom. This included the intent of the meeting and how the products of the meeting might be used. Terms of Reference were outlined. Draft research documents entitled "Information in support of a Recovery Potential Assessment of Northern Madtom (*Noturus stigmosus*) in Canada" and "Recovery Potential Modelling of Northern Madtom (*Noturus stigmosus*) in Canada" had been developed by DFO and provided to participants in advance of the meeting. The draft reports were the basis for discussion and participants were encouraged to add to or change the material, as needed, to ensure that the best and most up-to-date information was included.

SPECIES DESCRIPTION, HABITAT REQUIREMENTS AND RESIDENCE

Presenter: Nick Mandrak

This presentation included information on the description of the Northern Madtom, including body shape, and how colour patterns used to distinguish it from other madtoms that can occur with it. A participant mentioned a newly described species, Piebald Madtom. This species used

to be classified as allopatric populations of Northern Madtom from Mississippi and Tennessee. It was suggested that differences in body shape and patterns between the two species be mentioned. The participant also thought it would be appropriate to mention that five species of *Noturus* occur in Canada. One participant commented that different references were being used for maximum total length, and that it should be standardized.

Habitat requirements for spawning and different life stages were outlined. A participant inquired about the assumption that there was no evidence of multiple clutches. Another participant cited a paper reporting that wide variation in clutch sizes might be due to females laying eggs in multiple nests. A participant asked whether Piebald Madtom occurred in Kentucky, due to reference from Kentucky regarding spawning. The Piebald Madtom does not occur in Kentucky.

Physical habitat in which Northern Madtom has been collected was summarized. A participant inquired about where the crest of the shipping channel in the St. Clair River is located. It is at the edge of where the dredging occurs. It was also noted that depths in the St. Clair and Detroit rivers on the Canadian sides are greater than what has been sampled due to gear restrictions. A participant mentioned that an American researcher captured Northern Madtom in the St. Clair River in 2011, but data on depth of capture were not available at this time.

Definition of a residence was given. Based on the DFO definition, Northern Madtom would have a residence. A participant mentioned part of the definition involves investment, such as defending a nest. Another participant suggested that the length of time spent guarding the nest would strengthen the argument regarding applicability of residence.

POPULATION STATUS
Presenter: Nick Mandrak

The presenter gave an overview of the population status including the current distribution map and explanation of Relative Abundance Index (RAI), Population Trajectory and Certainty. One participant requested that the distribution map use the adopted convention for symbol colours and types from other RPA reports, and that the symbols for the Sydenham River not be unique, but reflect the rest of the symbols. One participant asked if the RAI was qualitative or quantitative. The RAI is qualitative in the case of the Northern Madtom due to limited amounts of data. The presenter then explained how RAI and Population Trajectory were combined to summarize the Population Status for each population.

One participant asked if Detroit River RAI had to be High because it had the largest population. The chairperson explained that this was not necessarily the case, given the overall low numbers from the river. There was much discussion about the Detroit River population. With the exception of Fighting Island, Canadian records are between International Bridge and Peche Island, with no other collections in the lower 2/3 of the river. RAI was changed to Medium with a Certainty of 2 (based on CPUE or standardized sampling). Population trajectory was Unknown due to limited historical data. A participant stated that Northern Madtom has been collected in the Detroit River where habitat improvements have been made, suggesting that "preferred" habitat is lacking in the river, and perhaps elsewhere. Another participant suggested that the term "preferred" was being misused, as scientific preference studies had not been conducted, and that terminology should be changed.

One participant summarized sampling that has been conducted in the St. Clair River, including U.S. records from the lower stretch of the river and recent observations from the upper end at Bluewater Bridge. It was noted that the St. Clair River is a narrow, fast river with a U-shaped channel, basically an extension of Lake Huron, and that species diversity was much higher at

the delta near Lake St. Clair. After much discussion, RAI was ranked as Low and Trajectory was Unknown, both with Certainty based on Expert Opinion. It was suggested that a footnote be included to indicate that abundance might be higher, but was Low due to limited sampling.

The chairperson summarized the comprehensive sampling undertaken in Lake St. Clair. Participants said that several systematic surveys had been done in Lake St. Clair with no Northern Madtom collected. RAI was Low with a Certainty of 2. Population Trajectory was Unknown.

For the Thames River, it was suggested that Population Trajectory should be Unknown, as data are known only from the last few years. RAI was left as Medium. It was noted that the Thames River is a much smaller system, and that Northern Madtom have been detected on a regular basis in low numbers. All strata can be sampled. There remains much of Thames River that has not been sampled, but areas that have been sampled have produced regular captures. Certainty is a 3.

For the Sydenham River, a participant suggested that Extirpated be changed to Likely Extirpated from a recovery perspective. Access is poor in many stretches of the river. Not much targeted sampling has been undertaken for Northern Madtom. Other participants disagreed, suggesting that sampling was adequate. Many Brindled Madtoms have been captured throughout the Sydenham River, but not Northern Madtom, and vice versa for the Thames River. Repeated intensive sampling has been conducted. Habitat where the 1975 specimen was captured is not unique to the river, so therefore not a micro-habitat issue. A participant asked whether a viable population ever existed in the Sydenham River. The presenter suggested that, given unlikely gene flow between other rivers, a population, however small, existed there. Also, the two historical collections from the river are quite a distance from each other, suggesting that a larger population might have existed previously. A participant suggested that the Sydenham River might not provide good habitat for Northern Madtom, perhaps explaining the very low numbers captured there.

A comment was made about the present distribution, speculating that there exists a fragment of a former more continuous distribution.

RECOVERY TARGETS, THREATS, AND ALLOWABLE HARM
Presenter – Sarah Matchett

The presenter gave an outline of how the model was derived, including the representation of the life cycle of Northern Madtom in Canadian waters. The presentation also included elements of the life cycle that are sensitive to harm or recovery efforts; recovery targets for habitat and abundance and how they were set; how the results and recommendations are affected by density-dependence, and what uncertainties are associated with data.

A participant asked a question about matrix values, which was addressed. Suggestion for a sample calculation in the Appendix of the modeling document was made. A participant asked whether using a maximum size of 132 mm rather than 123 mm would have made a difference in results. Survival and growth rate would have been lower, but elasticities and recovery targets would not have changed. A maximum size of 132 mm was not used as it was a statistical outlier and not typical of large madtoms. Another participant asked a question about why deterministic mean for a declining population was higher than that for an equilibrium population. It was noted that these were not the values of the parameters, but rather elasticities (relative importance) of the parameter for determining growth rate, and how important the proportion of fish maturing at age 1 is in affecting your growth rate. Deterministic mean is an analytical solution (shifting vital

rate), the stochastic mean is a result of 5000 draws. Another question was asked regarding fecundity, and why it was the same for 2 year old and 3 year old females, as fecundity usually increases with age/growth of the individual. Fecundity data are lacking, and it was assumed that with short-lived species, most of the growth occurs early, and that increases in body size between ages 2 and 3 would be minimal. It was noted by the chairperson that an Allowable Harm section, typical in a SAR report, would be replaced with a Population Sensitivity section due to insufficient data. Conclusions were that, given all of the uncertainties related to data, harm would not be allowed to survival of survival of Young-of-the-Year (YOY) and juveniles, and that nesting habitat is most important habitat to protect. There was a suggestion that allowable harm to adults might be acceptable, but given insufficient data, that amount is not known. A participant asked how harming adults would not also result in harm to YOY and juveniles, and suggested that this be explained in the modeling document. A participant asked the rationale for using 10% for catastrophes when 15% have been used in other reports. The response from the presenter was that the species is so short lived 100 years ends up being a much larger number of generations than for longer-lived fishes. The participant also asked if a recovery target (Minimum Viable Population (MVP)) of 2.7 million adult fish was realistic. It was noted that the more uncertain your parameters are, the larger your recovery target is because it is based on stochastic simulations. The chairperson asked why 0.03 was used for probability of extinction. The response was that 0.03 was the balance point that maximizes the reduction in risk, or the increase in population size. The model assumes that mature reproductive fish spawn every year.

THREAT STATUS
Presenter: Nick Mandrak

The presenter outlined the Threat Status, with each population ranked in terms of Threat Likelihood, Threat Impact and Certainty. Definitions of each component were summarized. The Threat Matrix was then populated with these values. A participant asked about the definition of physical habitat loss and degradation. Degradation includes physical habitat loss as well as siltation and turbidity at the very least. Physical habitat loss is any absolute loss, which could include infilling, dredging, dyking, and shoreline hardening. Another question was asked regarding linkage between siltation and turbidity. A waterbody can be turbid without siltation accumulating on the substrate. There was a discussion about the term Exotic Species. It was suggested that it be renamed to Invasive Species, with a footnote in the research document to define exactly what is meant, or changed to reflect one of the definitions in a published paper.

The presenter then went through the threats for each population, and opened it up for discussion.

<u>Detroit River</u>

One participant felt that the impact of climate change was a bit high. An additional reference on climate change was suggested, looking at water level drops in Lake St. Clair. Another participant noted that Northern Madtom spawns late in year, and that an increase in water temperature might actually favour higher juvenile survival due to earlier spawning. It was also noted, however, that other variables besides temperature could change, such as flow, vegetation, and competitors, and that effects could be positive or negative. Climate change was changed to Unknown. Another participant suggested that was worth mentioning that these are Impaired Beneficial Uses. It was admitted that there is great uncertainty when predicting the effect of climate change on Northern Madtom. A participant noted that turbidity is higher on Canadian side of the Detroit River than the U.S. side due to inputs from the Thames River. Wherever there is an embayment, there is a lot of silt. But with only a 21 hour retention time,

fines are not found in the rest of the river. Another participant stated that Northern Madtom was not captured in areas of silt, but in main channel areas in 2-5 m of water, with velocities of 0.3-0.6m/sec.

Thames River

It was noted that loads are remarkably silt free where Northern Madtom is found. Siltation is present in the river, but not where Northern Madtom has been collected, which is in high gradient areas. Because there are no barriers on the river, there are no areas of significant siltation. Particles wash themselves out of the system. One participant did suggest that if siltation was to occur, the impact would be Hhigh. This might be why they are not found downstream. A suggestion was made that the Thames River is turbid due to natural geology. Clay plain is at lower end below Highway 402 near Wardsville. Land use is an issue, but the river likely has always been turbid. Threat Impact for turbidity was lowered to Medium. Nutrient loading might increase algal blooms, and lower oxygen levels, as the river is over-subscribed for phosphorus levels. In certain areas, Sewage Treatment Plants might actually be diluting nutrient levels. One participant asked about fish condition (e.g., presence of lesions, tumors) in the river. The response was that all species except for most sizes of Channel Catfish appeared to look healthy. With respect to exotic species, gobies have been found at Kent Bridge, so invasion is imminent. The Threat Impact was raised to High. It was felt that the Thames River would be more susceptible to climate change than Detroit River, as it is smaller and flow variability is more of an issue. It was also noted that the river is a very flashy system (rain sensitive, tile drains, storm runoff).

St. Clair River

Due to the channel shape of St. Clair River, it was noted that, unlike the Detroit River, maintenance in the form of dredging occurs closer to where Northern Madtom has been found. The threat to Physical Habitat Loss was ranked as Medium. One participant asked about the amount of dredging in the river. Dredging occurs to 8.3 metres in depth, and the dredgeate is dumped on either side of the shipping channel. Siltation was considered to be Low, as there are very few areas for it to accumulate. Some silt accumulates behind islands, but not in run of river. With respect to turbidity, one participant stated visibility is greater than 1 metre in the summer and fall, which is clearer than any other waterbody in which Northern Madtom is found so Threat Likelihood was changed to Unlikely. Nutrient Loading was switched to Low impact. Contaminants are higher on Canadian side due to petroleum industries situated at the headwaters of the river. The threat of invasive species is High due to round goby. Climate change is likely similar to the Detroit River.

Lake St. Clair

It was noted that the south shore has been armoured in several areas. A question was asked if those areas were ever used by Northern Madtom. It would be speculation at this point. Dredging and shoreline modifications were identified by one participant as the major impacts causing habitat loss. Northern Madtom has been captured in nearshore habitats, but none were found using nearshore trawling, a preferred method of sampling in other waterbodies. The Threat Impact for physical habitat loss was changed to Medium. It was also noted that nearshore is very silty from inputs from the Thames River. Another participant noted that burrowing mayfly (Genus *Ephemera*) have been collected, indicating sandy substrates. Turbidity is high in the lake due to the Thames River plume, and from wind turbidity. However, a participant stated that turbidity has been reduced in the lake since the invasion of Zebra Mussels. Threat Impact of turbidity was reduced to Low. It was suggested that the nutrient loading was similar to Thames

River and that algal blooms occurred along the lake. Toxic compounds are found at four sites along shore, all associated with marinas, but that overall, the threat was Low. The round goby is present in the lake and is considered a High threat. The effect of climate change was thought to be High, as any water loss in a shallow lake such as Lake St. Clair would result in several negative impacts.

Sydenham River

It was suggested that habitat loss in the Sydenham River would be similar to that in the Thames River. Siltation is a problem in the watershed, and the threat was ranked as High. Like the Thames River, turbidity is high in the Sydenham River. The threat was ranked as Medium, however, as Northern Madtom is a nocturnal sensory feeder that is probably not greatly affected by turbidity. With the Sydenham River having a lower gradient than the Thames River it was speculated that nutrients, silt and toxic compounds might linger in the Sydenham River longer. Although there were more toxic compounds than in the Thames River, the Impact was still Low. The Round Goby has been captured at the same location (town of Florence) as the most recent Northern Madtom record (1975). Climate change was thought to be similar to the Thames River, as these are smaller systems than the Detroit and St. Clair rivers.

SPATIAL AND TEMPORAL EXTENT OF THREATS
Presenter: Nick Mandrak

The presenter gave an overview of the spatial and temporal extent of the threats, including differences between widespread and local spatial extent, and chronic and ephemeral temporal extent. No issues were raised with respect to the assigned categories in the research document.

ALLOWABLE HARM
Presenter: Nick Mandrak

The presenter summarized statements related to Allowable Harm, cautioning that wording be such that research would be allowed in order to collect data to determine harm. A participant asked what the difference was between abundance estimates and population trajectory, and whether you can have an abundance estimate and still have an unknown population trajectory. You can still have up to two points, and still not know what the trajectory is. The participant also asked if it was relative abundance for this species. If abundance exceeds the recovery target, then some harm might be allowed. If not, regardless of the trajectory, you might not want to allow any harm. Another participant stated that some sampling would be desirable to provide better information about the target, because presently it is based on a modeling exercise. The presenter stated that this will be identified in the Sources of Uncertainty. It was questioned as to whether the statements regarding Allowable Harm were compatible with each other. It is not known if the population is in decline due to lack of information.

The presenter summarized the current situation, suggesting assessment of allowable harm cannot be made; therefore there is no scope for allowable harm until we collect data that will allow us to actually assess it. Once data are collected, an advisory meeting will be needed. Permitting decision can't be made, except for scientific collection permits. A question was raised regarding permit requests. Two examples, both in the Detroit River were given. Given the wording for Allowable Harm, if Northern Madtom would have been captured during fish salvage mitigation measures, both projects would not have been allowed to continue. A participant asked whether permits were required for dredging to maintain shipping channels. Permits are required, but proponents have not been applying for them.

ALTERNATIVES TO ACTIVITIES/FEASIBLE MITIGATION METHODS
Presenter: Nick Mandrak

The presenter outlined the alternatives to activities and feasible mitigation measures, and mentioned that not much direction had come from Headquarters on how to deal with mitigations to habitat-related threats. This is a recurring theme in Central and Arctic. To aid Habitat Management personnel, threats have been linked to Pathways of Effects (PoE). Feasible mitigation for the PoE could then be pasted into all RPAs. The presenter then gave an explanation of the PoE. No concerns were identified. Additional mitigation measures and Alternatives for threats not covered in the PoE, such as Exotic Species were then given. A participant requested an example of an authorized introduction. The response was introducing Brook Trout instead of Brown Trout, as Brook Trout are native and co-evolved with local species at risk. Another question was raised regarding introductions made by bordering states. It was mentioned that the Great Lakes Fishery Commission usually handles these issues. As Northern Madtom has the same status (Endangered) in Michigan and Ohio as in Ontario, the level of concern regarding species introductions should be the same. The main concern is Round Goby.

SOURCES OF UNCERTAINTY
Presenter: Nick Mandrak

The presenter summarized the sources of uncertainty for habitat and populations, threats, recovery targets and allowable harm. No issues were raised.

OVERVIEW OF DISCUSSION
Presenter: Nick Mandrak

The presenter gave an overview of the discussion and asked for comments. Much discussion revolved around the length of spawning period. With 23°C used as a temperature trigger, it was suggested that June to September be designated as the spawning season. This would include one month of guarding YOY, and incorporate uncertainty as to when spawning actually begins. This might be earlier in the Thames River, if water temperature reaches 23°C by June.

A question was raised regarding how the estimated habitat that is required (minimum area for population viability (MAPV)) relates to the Area of Occupancy in the COSEWIC report. It would be useful to understand what percentage of currently known habitat is required and if these predictions exceed the amount of habitat that we have already estimated that is occupied by Northern Madtom. It was mentioned that the COSEWIC index is not the biological index, and includes land, in some cases. It was also mentioned that MAPV refers to habitat that is suitable. From the recovery strategy for Northern Madtom, critical habitat (which is basically all of the known occupied habitat) is 300 hectares for the Thames River; 200 hectares for the Detroit River near Peche Island; and 200 hectares for the Detroit River near Fighting Island.

TERMS OF REFERENCE
Presenter: Nick Mandrak

The terms of reference were reviewed to evaluate which were or were not addressed during the meeting. To the extent possible terms of reference 1, 2, 3, 4, 6, 7, 8, 9, 11, 17, 18, 21, 22, 23 were addressed during the meeting. The following terms of reference were either not addressed at all or were only partially addressed:

(5) Population trajectories projections were not made and the rationale was included in the modelling research document.

(10) The meeting did not address specifically how the biological functions of specific habitat features varied (quantitatively) with the quality or quantity of habitat as this information is unavailable.

(12) There are insufficient data available to provide advice on how much habitat of various qualities / properties exists at present.

(14) There are insufficient data available to provide advice on feasibility of restoring habitat to higher values, if supply may not meet demand by the time recovery targets would be reached,

(15) It was not possible to provide advice on risks associated with habitat "allocation" decisions, as we don't know the present demand on the habitat since we don't know the current population size.

(24) We were unable to estimate the reduction in mortality rate expected from mitigation measures, alternatives or enhanced productivity. This is difficult to do for habitat threats and focuses more on threats from harvesting which doesn't apply to this species.

(25) There are insufficient data available to evaluate scenarios.

(26) There is insufficient information on the species to recommend parameter values for population productivity and starting mortality rates, etc.

The following terms of reference were partially addressed:

(13) The modelling report identifies the habitat demands at the biologically based recovery target but since we do not know the current population size we don't know the current habitat demands.

(16) We have provided some advice on habitat threats but we are unable to quantify how the threats alter the quality and/or quantity of habitat that is available.

(19) We did not explicitly quantify the likelihood that the current quantity and quality of habitat is sufficient to allow population increase, and would be sufficient to support a population that has reached its recovery targets. We did provide some elements that could be used for this. The presenter indicated that we should compare the MAPV to the numbers in the recovery strategy related to the extent of critical habitat.

(20)- There are insufficient data available to assess the magnitude by which current threats to habitats have reduced habitat quantity and quality.

(27) We provided some guidance (first steps) but there are insufficient data to determine the maximum human-induced mortality

REFERENCES

DFO. 2007a. Revised Protocol for Conducting Recovery Potential Assessments. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/039.

DFO. 2007b. Documenting habitat use of species at risk and quantifying habitat quality. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/038.

Appendix 1. Terms of Reference

Recovery Potential Assessment of Northern Madtom (*Noturus stigmosus*)
Regional Peer Review Meeting – Central and Arctic Region

March 19, 2012

WebEx / Teleconference

Chairperson: Nicholas E. Mandrak

Context
When the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designates aquatic species as threatened or endangered, Fisheries and Oceans Canada (DFO), as the responsible jurisdiction under the *Species at Risk Act* (SARA), is required to undertake a number of actions. Many of these actions require scientific information on the current status of the species, population or designable unit (DU), threats to its survival and recovery, and the feasibility of its recovery. Formulation of this scientific advice has typically been developed through a Recovery Potential Assessment (RPA) that is conducted shortly after the COSEWIC assessment. This timing allows for the consideration of peer-reviewed scientific analyses into SARA processes including recovery planning.

The Northern Madtom is currently assessed, and listed as, Endangered by COSEWIC and SARA, respectively. An update status report and subsequent assessment is currently being undertaken by COSEWIC. A recovery strategy for this species will be posted to the Environmental Registry imminently. The recovery potential analysis will support the update status report, recovery strategy, permitting, and identification of critical habitat.

In support of listing recommendations for this Northern Madtom by the Minister, DFO Science has been asked to undertake an RPA, based on the National Frameworks (DFO 2007a and b). The advice in the RPA may be used to inform both scientific and socio-economic elements of the listing decision, as well as development of a recovery strategy and action plan, and to support decision-making with regards to the issuance of permits, agreements and related conditions, as per section 73, 74, 75, 77 and 78 of SARA. The advice generated via this process will also update and/or consolidate any existing advice regarding this species.

Objectives

- To assess the recovery potential of Northern Madtom.

Assess current/recent species/ status

1. Evaluate present status for abundance and range and number of populations.

2. Evaluate recent species trajectory for abundance (i.e., numbers and biomass focusing on mature individuals) and range and number of populations.

3. Estimate, to the extent that information allows, the current or recent life-history parameters (total mortality, natural mortality, fecundity, maturity, recruitment, etc.) or reasonable surrogates; and associated uncertainties for all parameters.

4. Estimate expected population and distribution targets for recovery, according to DFO guidelines (DFO 2005, and 2011).

5. Project expected population trajectories over three generations (or other biologically reasonable time), and trajectories over time to the recovery target (if possible to achieve), given current parameters for population dynamics and associated uncertainties using DFO guidelines on long-term projections (Shelton *et al.* 2007).

6. Evaluate residence requirements for the species, if any.

Assess the Habitat Use

7. Provide functional descriptions (as defined in DFO 2007b) of the required properties of the aquatic habitat for successful completion of all life-history stages.

8. Provide information on the spatial extent of the areas that are likely to have these habitat properties.

9. Identify the activities most likely to threaten the habitat properties that give the sites their value, and provide information on the extent and consequences of these activities.

10. Quantify how the biological function(s) that specific habitat feature(s) provide to the species varies with the state or amount of the habitat, including carrying capacity limits, if any.

11. Quantify the presence and extent of spatial configuration constraints, if any, such as connectivity, barriers to access, etc.

12. Provide advice on how much habitat of various qualities / properties exists at present.

13. Provide advice on the degree to which supply of suitable habitat meets the demands of the species both at present, and when the species reaches biologically based recovery targets for abundance and range and number of populations.

14. Provide advice on feasibility of restoring habitat to higher values, if supply may not meet demand by the time recovery targets would be reached, in the context of all available options for achieving recovery targets for population size and range.

15. Provide advice on risks associated with habitat "allocation" decisions, if any options would be available at the time when specific areas are designated as critical habitat.

16. Provide advice on the extent to which various threats can alter the quality and/or quantity of habitat that is available.

Scope for Management to Facilitate Recovery

17. Assess the probability that the recovery targets can be achieved under current rates of parameters for population dynamics, and how that probability would vary with different mortality (especially lower) and productivity (especially higher) parameters.

18. Quantify to the extent possible the magnitude of each major potential source of mortality identified in the pre-COSEWIC assessment, the COSEWIC Status Report, information from DFO sectors, and other sources.

19. Quantify to the extent possible the likelihood that the current quantity and quality of habitat is sufficient to allow population increase, and would be sufficient to support a population that has reached its recovery targets.

20. Assess to the extent possible the magnitude by which current threats to habitats have reduced habitat quantity and quality.

Scenarios for Mitigation and Alternative to Activities

21. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all feasible measures to minimize/mitigate the impacts of activities that are threats to the species and its habitat (steps 18 and 20).

22. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all reasonable alternatives to the activities that are threats to the species and its habitat (steps 18 and 20).

23. Using input from all DFO sectors and other sources as appropriate, develop an inventory of activities that could increase the productivity or survivorship parameters (steps 3 and 17).

24. Estimate, to the extent possible, the reduction in mortality rate expected by each of the mitigation measures in step 21 or alternatives in step 22 and the increase in productivity or survivorship associated with each measure in step 23.

25. Project expected population trajectory (and uncertainties) over three generations (or other biologically reasonable time), and to the time of reaching recovery targets when recovery is feasible; given mortality rates and productivities associated with specific scenarios identified for exploration (as above). Include scenarios which provide as high a probability of survivorship and recovery as possible for biologically realistic parameter values.

26. Recommend parameter values for population productivity and starting mortality rates, and where necessary, specialized features of population models that would be required to allow exploration of additional scenarios as part of the assessment of economic, social, and cultural impacts of listing the species.

Allowable Harm Assessment

27. Evaluate maximum human-induced mortality which the species can sustain and not jeopardize survival or recovery of the species.

Expected Publications

- Science Advisory Report
- Proceedings
- Research Document(s)

Participation

- Fisheries and Oceans Canada (DFO) (Science, Ecosystems and Fisheries Management, Policy and Economics sectors, Habitat and Species at Risk programs)
- Province of Ontario
- Academics
- Conservation Authorities
- Other invited experts

References

COSEWIC. 2002. COSEWIC assessment and update status report on the on the Northern Madtom *Noturus stigmosus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 15 pp. http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_northern_madtom_e.pdf

DFO. 2005. A framework for developing science advice on recovery targets for aquatic species in the context of the Species at Risk Act. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2005/054.

DFO. 2007a. Revised Protocol for Conducting Recovery Potential Assessments. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/039.

DFO. 2007b. Documenting habitat use of species at risk and quantifying habitat quality. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/038.

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Appendix 2. Meeting Participants

Name	Affiliation
Jason Barnucz	Fisheries and Oceans Canada - Science
Linda Corkum	University of Windsor
Alan Dextrase	Ontario Ministry of Natural Resources
Scott Gibson	Ontario Ministry of Natural Resources
Marten Koops	Fisheries and Oceans Canada - Science
Nick Mandrak (Chair)	Fisheries and Oceans Canada -Science
Kathleen Martin	Fisheries and Oceans Canada - Science
Sarah Matchett	Contractor for Fisheries and Oceans Canada
Bruce McCulloch	COSEWIC status report author
Scott Reid	Ontario Ministry of Natural Resources
Shawn Staton	Fisheries and Oceans Canada – Species at Risk
Jennifer Young	Fisheries and Oceans Canada - Science

Appendix 3. Agenda

Recovery Assessment Potential – Northern Madtom
Regional Peer Review Meeting – Central and Arctic Region

March 19, 2011

WebEx / CCIW R260

9:00 am to 12:00 pm
1:00 pm to 4:00 pm

Chair: Nick Mandrak

Time	Presenter
Welcome and Introductions	Nick Mandrak
Purpose of Meeting	Nick Mandrak
Species Status and Habitat Requirements	Nick Mandrak
Recovery Targets	Sarah Matchett
Population Status	Nick Mandrak
Threats	Nick Mandrak
Allowable Harm	Jennifer Young
Alternatives to Activities/ Feasible Mitigation Methods	Nick Mandrak
Wrap-up	Nick Mandrak